REMARKS

The Official Action dated August 16, 2004 has been received and its contents carefully noted. In view thereof, the title as well as claims 38, 44, 45 and 52-59 have been amended to correct informalities noted by the Examiner and to better define the claimed invention. Accordingly, claims 1-9 and 38-60 are presently pending in the instant application, with claims 1-9 being withdrawn from further consideration.

With reference no to the Official Action and particularly page 3 thereof, as can be seen from the foregoing amendments, the title has been as suggested by the Examiner. Accordingly, it is respectfully submitted that Applicant's specification is now in proper formal condition for allowance.

Further on page 3 of the Official Action, claims 38, 39, 44-46, 48, 52, 55 and 60 have been rejected under 35 U.S.C. §102(e), as being anticipated by U.S. Patent Publication No. 20040075126A1 issued to Fujiwara et al. This rejection is respectfully traversed in that the publication to Fujiwara et al. neither discloses nor suggests that which is presently set forth by Applicant's claimed invention.

Specifically, as set forth in Applicant's previous response, the method set forth in claim 38 includes the steps of:

a) forming a metal lower electrode on a substrate;

b) annealing the metal lower electrode in a reducing atmosphere that contains impurity atoms;

c) forming a capacitive insulating film on the metal lower electrode after the step b); and

d) forming an upper electrode on the capacitive insulating film,

wherein the impurity atoms are introduced into the metal lower electrode in the step b).

As the Examiner can readily appreciate, in accordance with Applicants' claimed invention, the metal lower electrode is annealed in an atmosphere that contains impurity atoms having a reducing function, so that the impurity atoms having a reducing function are introduced into the metal lower electrode. Thus, even when the metal lower electrode is annealed in an oxidizing atmosphere in a subsequent step, the partial oxidation of the lower electrode can be suppressed. Consequently, the electrode is not deformed.

With reference to the Fujiwara et al. reference and particularly those portions of the specification relied on by the Examiner, it is noted that the Examiner points out that Fujiwara et al. discloses "a lower metal capacitor electrode 16 (page 4, paragraph 51) in a reducing atmosphere that contains hydrogen and impurity atoms (page 1, paragraph 4; page 2, paragraph 21; page 5, paragraph 54 and page 7, paragraph 75). However, the Examiner is incorrect in this regard and Fujiwara et al. fails to disclose "a lower metal capacitor electrode in a reducing atmosphere that contains hydrogen impurity atoms".

Specifically, page 1, paragraph 4 of Fujiwara et al., discloses that the polarizing characteristics of ferroelectrics tend to deteriorate due to hydrogen involved in the process which is carried out after the capacitor has been formed, and that if the top electrode is made of platinum, hydrogen is decomposed into active hydrogen due to a platinum catalytic action. Moreover, with respect to page 2, paragraph 21 of Fujiwara et al., it is noted that the polarization of the ferroelectric capacitor is greatly affected by hydrogen which is evolved in the steps of passivation (to form an insulating protective film) and packaging in the LSI manufacturing process, that the top electrode made of the Pt-Pb intermetalic compound protects the ferroelectric thin film from being attacked by active hydrogen.

Furthermore, with respect to paragraph 54 and 75 of the Fujiwara et al. reference, these paragraphs disclose the evaluation of a range of Pb composition which is most effective in preventing deterioration due to hydrogen reduction when the top electrode is made of the Pt-Pb intermetalic compound and further that the deterioration of polarizing characteristics due to hydrogen is prevented using Pt_3Pb for the first layer. Accordingly, each of these paragraphs disclose the affect of hydrogen after the formation of the top electrode. Hence, each of the paragraphs noted by the Examiner fails to disclose that the impurity atoms having a reducing function are introduced into the metal lower electrode prior to the formation of the ferroelectric thin film (capacitor dielectric film), as is recited by Applicants' claimed invention.

The Examiner further asserts that Fujiwara et al. discloses "annealing the lower electrode" and relies on paragraph 53 of page 5 of the Fujiwara et al. publication. However, it is noted that paragraph 53 merely discloses the heat treatment for crystallization of the ferroelectric thin film after the formation of the ferroelectric thin film 30. As the Examiner can readily appreciate, the heat treatment of the present invention is conducted to introduce the impurity atoms having a reducing function into the metal lower electrode prior to the formation of the capacitor dielectric film. Consequently, the present invention clearly distinguishes over the teachings of Fujiwara et al. in view of the order and the subject of the heat treatment set forth therein.

With reference to page 5 of the Office Action, claims 40 and 43 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Fujiwara et al. in view of U.S. Patent No. 5,723,379 issued to Watanabe et al. Again, this rejection is respectfully traversed in that the patent to Watanabe et al. fails to overcome the aforementioned shortcomings associated with the teachings of Fujiwara et al. discussed in detail hereinabove.

That is, Applicants' claimed invention as recited in independent claim 38 resides in including the step of introducing the impurity atoms having a reducing function into the metal lower electrode while annealing the lower electrode in an atmosphere containing the impurity atoms. Fujiwara et al. clearly fails to disclose or suggest such features and the patent to Watanabe et al. fails to overcome such shortcomings. Accordingly, it is respectfully submitted that Applicants' claimed invention as set forth in claims 40 and 43 which are directly dependent upon independent claim 38 and include all the limitations thereof are in proper condition for allowance.

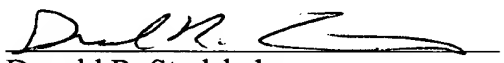
Likewise, with respect to the rejection of the remaining dependent claims 41, 42, 47, 49-51, 53, 54 and 56-59, each of these claims have been rejected under 35 U.S.C. §103(a) as being unpatentable over Fujiwara et al. in view one of several secondary references namely U.S. Patent No. 6,319,765 issued to Cho et al., U.S. Patent No. 6,146,938 issued to Saida et al. and U.S. Patent No. 5,825,609 issued to Andricacos et al. These rejections are respectfully traversed for the reasons set forth hereinabove in detail with respect to independent claim 38 and the shortcomings of the Fujiwara et al. reference.

That is, as noted hereinabove, Applicants' claimed invention as recited in independent claim 38 resides in including the step of introducing the impurity atoms having a reducing function into the metal lower electrode while annealing the lower electrode in an atmosphere containing impurity atoms. Fujiwara et al. clearly fails to disclose the step of introducing the impurity atoms into the metal lower electrode in the manner set forth in accordance with Applicants' claimed invention. Moreover, the secondary references cited by the Examiner further fail to overcome the aforementioned shortcomings associated with the teachings of Fujiwara et al. Accordingly, it is respectfully submitted that each of the several dependent claims which include all the limitations of independent claim 38 are now in proper condition for allowance for the reasons discussed hereinabove.

In summary, in view of the foregoing amendments and reasons, it is respectfully requested that the rejections of record be reconsidered and withdrawn by the Examiner, that claims 38-60 be allowed and that the application be passed to issue.

Should the Examiner believe a conference would be of benefit in expediting the prosecution of the instant application, he is hereby invited to telephone counsel to arrange such a conference.

Respectfully submitted,



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